

thoroughly with scalecide or some other good miscible oil a few days before the buds burst. This substance will kill all the eggs that it covers, but to insure that the egg masses are all covered means that the spray must be forced right through the tree to the farthest twigs and branches on the opposite side, otherwise many egg masses situated on the inner side of these twigs and small branches will not be hit. The introduction of the new spray guns makes it a great deal easier to control these insects than it was a few years ago. It should be remembered that each barrel of scalecide should be diluted enough with water to make sixteen barrels of mixture for the orchard, and also that this substance is very effective against San José scale. In nearly every case the scalecide should be used two years in succession to insure full success.

NOTES ON COCCIDÆ II. (HEMIPTERA).

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As at present constituted, the genus *Sphærococcus* is nothing more than a convenient dumping-place for a considerable number of species that are but little understood—or it were entirely truthful to say not understood at all. The only character that the eighteen or twenty included species are supposed to have in common is that of the absence of hairs on the anal ring. I am informed by Mr. Harold Morrison, who has examined the types of *S. casuarinæ* Maskell, (the type of the genus), that setæ are present on the anal ring of this species, notwithstanding Maskell's assertion to the contrary. In fact, Mr. Morrison is somewhat inclined to believe that this species is nothing more than a species of *Antonina* and certainly the original description and figures support this conclusion. However that may be, some of the species now referred to this genus indubitably have nothing to do with the genotype and must be placed elsewhere. It is probable that but few of these can be assigned to recognized genera.

I am here naming new genera for three of the species now included in *Sphærococcus*. One of these, based upon *S. pulchellus* Maskell, belongs to the group now recognized as the tribe *Asterolecaniini* of the subfamily Dactylopiinæ. The other two, based

upon *S. cupressi* Ehrh. and *S. disticlum* (Kuwana), appear to belong to an unnamed group that includes *Kuwanina parvus* (Maskell) also. I consider this group to be equivalent in value to the groups at present recognized as tribes of the subfamily Dactylopiinae. Whatever that value may be is certainly questionable for this subfamily, like the genus *Sphaerococcus*, is a most unnatural and but little understood group that must eventually be disrupted and reorganized. Pending this upheaval I shall not name the group under consideration, but shall merely indicate as many of its characters as appear to be of value. The group may be characterized as follows:

Coccidæ referable to the subfamily Dactylopiinae (of the Fernald Catalogue), that is: without abdominal spiracles; end of the abdomen neither cleft nor pygidiform; without a pair of conspicuous lateral prominences. Distinguishable from the other groups of the subfamily chiefly by negative characters. Without dorsal ostioles or cerarii; anal lobes obsolete; without 8-shaped pores; tubular ducts without a filamentous prolongation but bearing at their inner extremity a more or less definitely multilocular pore; anal ring nearly or quite simple, with from two to six very small setæ; antennæ either well developed or vestigial; legs either entirely lacking or well developed.

Included genera: *Kuwanina* Ckll.; *Ehrhornia* new genus; *Paludicoccus* new genus.

KEY TO INCLUDED GENERA.

1. Adult female with well developed legs and antennæ, the latter 6-segmented.....*Ehrhornia*, n. gen.
Adult female without legs and with vestigial antennæ, the latter not more than 3-segmented.....2.
2. Adult female with a pair of small, circular cribriform plates on the ventral side of the abdomen.....*Kuwanina* Ckll.
Adult female without cribriform plates.... *Paludicoccus*, n. gen.

Kuwanina Ckll.

1903. Cockerell, T. D. A., in Fernald, Cat. Coccidæ, p. 101.
Coccidæ of the type described above. Adult female apodous and with the antennæ reduced to mere unsegmented tubercles.

Ventral side of the abdomen with a pair of small, circular, cribriform plates. Dermal pores quinquelocular, somewhat pentagonal in form. Anal ring appearing on the ventral side in the adult female, small, simple, with six small setæ. First stage larvæ with 3-segmented antennæ.

Type of the genus, *Sphærococcus parvus* Maskell.

Notes.—The original description of this genus consists merely of a quotation from a letter by Cockerell to the effect that, "Kuwana differs from Antonina by the larva having 3 or 4-jointed antennæ." It is rather difficult to understand why the genus was compared with *Antonina* rather than with the type of the genus from which it was removed.

Kuwanina parvus (Maskell).

1897. *Sphærococcus parvus* Maskell, Ent. Mon. Mag., vol. 33, p. 244.

1897. *Sphærococcus parvus* Mask.; Maskell, Trans. N. Zealand Inst., vol. 30, p. 247, pl. 27, figs. 9-11.

1902. *Sphærococcus parvus* Mask.; Kuwana, Proc. Calif. Acad. Sci, ser. 3, vol. 2, p. 56.

1903. *Kuwanina parvus* (Mask.); Ckll., in Fernald, Cat. Coccidæ, p. 121.

1915. *Kuwanina parvus* (Mask.); Green, Ent. Mon. Mag., vol. 51, p. 181, figs.

There is little to add to the description given by Green, other than to note that the pores are borne at the inner end of short ducts and that the derm of the abdomen presents a curiously roughened appearance. I have examined specimens from the material recorded by Kuwana in 1902. Mr. Morrison has sent me sketches made from the type of the species and these leave no doubt as to the correctness of the determination.

Ehrhornia, n. gen.

Coccidæ of the type described above. Adult female with well developed legs and antennæ, the latter 6-segmented. Ventral side of the abdomen without cribriform plates. Dermal pores for the most part circular and without distinct loculi. Anal ring appearing on the ventral side in the adult female, small, simple

and with from two to six small setæ. Larva with 6-segmented antennæ.

Type of the genus; *Sphærococcus cupressi* Ehrh. The genus includes also a second species, herein described as *E. graminis*, n. sp. The genus is named in honour of Mr. E. M. Ehrhorn.

***Ehrhornia cupressi* (Ehrh.)**

1911. *Sphærococcus cupressi* Ehrhorn, Can. Ent., vol 43, p. 277, figs. 3, 3 a, b, c.

This species will be redescribed at length in a forthcoming paper by Mr. F. B. Herbert, of the Bureau of Entomology, and I shall merely note that the original description is in error in regard to the statement that the anal ring is hairless. The anal ring has six small setæ.

***Ehrhornia graminis*, n. sp.**

(Fig. 12.)

In life.—Occurring in cracks and beneath scales on the root stock of the host; of a bright yellow colour; surrounded by more or less flocculent secretion.

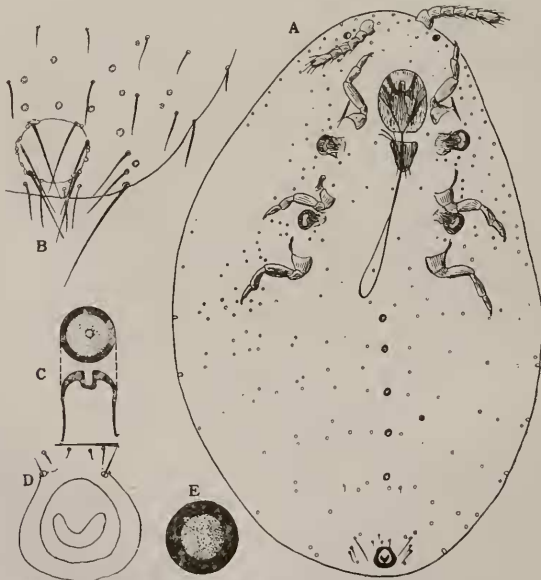


Fig. 12.—*Ehrhornia graminis*, n.sp.: A, female in last instar but not fully grown; B, posterior end of abdomen of first stage larva; C, dermal pore; D, anal ring of adult; E, large pore of the median ventral series.

Morphological characteristics.—Length of largest specimen (flattened on slide) 2.8 mm. Mounted specimens pyriform or circular. Adult female with well developed legs and with 6-segmented antennæ, the last segment longest. Derm membranous throughout except for some irregular chitinization in old individuals. Anal ring (in specimens flattened on the slide) appearing on the ventral side of the body, in old individuals at some distance from the posterior margin, quite small, heavily chitinized, non-cellular, bearing 2 small setæ. Body destitute of all but a very few extremely minute setæ and three slender setæ on each side of the anal ring. Dermal pores quite numerous, all circular, the majority borne at the inner end of short ducts. On the ventral side of the abdomen there is a median, longitudinal row of five quite large, sessile pores.

First stage larva with six-segmented antennæ. Body beset with many slender setæ, especially toward the posterior end. Anal ring simple, bearing six long setæ. Anal lobes lacking. Dermal pores numerous, circular, multilocular or occasionally trilocular.

Type host and locality.—From an undetermined species of perennial grass growing on the ridge about a mile east of the reservoir at Pacific Grove, Monterey County, Calif., Dec. 1, 1917. Collected by the author.

Paludicoccus, n. gen.

Coccidæ of the type described above. Adult female apodous and with the antennæ reduced to mere stubs, three-segmented. Ventral side of the abdomen without cribriform plates. Anal ring quite heavily chitinized, normally with 6 small setæ. Dermal pores circular and without distinct loculi. First stage larva with 6-segmented antennæ. Adult male apterous; antennæ 8-segmented.

Type of the genus; *Sphærococcus disticlum* (Kuwana).

Paludicoccus disticlum (Kuwana).

1902. *Pseudolecanium disticlum* Kuwana, Ent. News, vol. 13, p. 134, figs. 1, 2.

1903. *Sphærococcus disticlum* (Kuw.); Fernald, Cat. Coccidæ, p. 85.

The descriptions and figures given by Kuwana are in general

quite satisfactory, but there remain certain very important details that were overlooked.

The anal ring is not hairless, as was stated in the description, but bears six very small setæ. Due to the heavy chitinization of the body these are usually somewhat difficult to see. The antennæ

are 3-segmented. The dermal pores are in part trilocular but the majority are circular. The circular pores are in part multilocular and sessile and in part without distinct loculi, those of the latter type being borne at the end of short ducts.

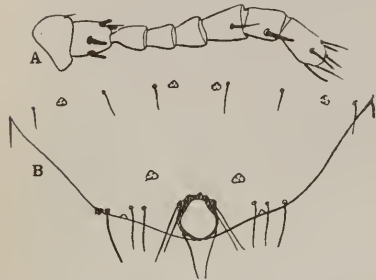


Fig. 13.—*Paludicoccus distictium* (Kuwana): A, antennæ of adult male; B, posterior end of abdomen of first stage larva.

adult only in the membranous condition of the derm and the smaller spiracles.

The adult male is apterous. The antennæ are 8-segmented and somewhat clavate. The body is entirely destitute of hairs except for a group of three long setæ on each side at the posterior end of the abdomen. The eyes each consist of a dorsal and a ventral ocellus, the former the larger.

Material examined.—Type and topotype specimens.

Callococcus, n. gen.

Coccidæ referable to the tribe Asterolecaniini of the subfamily Dactylopiinæ (of the Fernald Catalogue). Adult female apodous and with the antennæ reduced to mere chitinized points. Anal lobes lacking. No stigmatic clefts or stigmatic spines. Anal ring extremely obscure—apparently hairless. Pores of the 8-shaped type confined to a longitudinal row which extends along the median line of the dorsum from one end of the body to the other. Derm with many tubular ducts of the type common to the tribe, these especially numerous along the median line of the dorsum.

First stage larva without anal lobes; with the anal ring extremely minute and hairless; 8-shaped pores large, confined to the margin of the body; antennæ 4-segmented.

Type of the genus: *Sphærococcus pulchellus* Maskell.

Notes.—Although this genus appears to be unquestionably Asterolecanine it differs markedly from any other known to me. I can say nothing in regard to its relationship with the other members of the group.

Callococcus pulchellus (Maskell).

1896. *Sphærococcus pulchellus* Maskell. Trans. N. Zealand Inst., vol. 29, p. 324, pl. 21, figs. 10-13.

The adult female of this species is enclosed in a pretty, waxy covering that has been well described by Maskell.

Morphological characteristics.—Adult female merely an elongate, oval sac, without appendages of any sort. Anal lobes entirely lacking, their position not indicated by setæ. Anal ring probably very minute and hairless, a

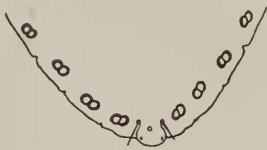


Fig. 14.—*Callococcus pulchellus* (Maskell): posterior end of abdomen of first stage larva.

it does not appear even in well stained preparations.

Derm membranes except for a narrow, somewhat irregular, longitudinal, chitinized area extending the full length of the body along the median line of the dorsum. This area appearing only in fully mature individuals. Derm with many rather short, tubular ducts, these especially numerous along the dorsal area just described. Pores of the 8-shaped type extremely minute and inconspicuous, confined to a row which extends along the median line of the dorsum from one end of the body to the other. In the fully mature insect this line of pores is almost entirely obscured by the chitinization of the dorsum.

First stage larva with 4-segmented antennæ. Anal lobes lacking, the posterior end of the abdomen pointed. Anal ring extremely minute, hairless. Derm destitute of hairs and with a single, marginal row of large, 8-shaped pores.

Material examined.—Specimens determined by Froggat as this species and agreeing in all respects with the original description.

Mycetococcus, n. gen.

Coccidæ referable to the tribe Asterolecaniini of the subfamily Dactylopiinæ (of the Fernald Catalogue). Adult female apodous and with the antennæ reduced to mere unsegmented tubercles. Body top-shaped, ending in a pair of prominent lobes, which, together with the last segment of the abdomen, are heavily chitinized.

Type of the genus: *Cerococcus ehrhorni* Ckll. *Cerococcus corticis* Towns. and Ckll., also included.

Notes.—The description here given will doubtless appear extremely short, but the characters enumerated are the only ones that the two species included have in common. Although the two are very similar in general appearance and occur upon hosts of the same genus, I am unable to avoid the conviction that they are not congeneric and perhaps should not even be referred to the same group. It has seemed best, however, to place them together until the value of the characters that seem to separate them has been more fully investigated. These differences will be discussed under the species. Neither of the species can be considered as having anything in common with the genus *Cerococcus* to which they have been referred. The first stage larvæ are very different from those of typical *Cerococcus*, the adults lack the "cauda" between the anal lobes and the cribriform plates of the latter genus while the heavily chitinized anal lobes and terminal segment of the abdomen are quite distinctive.

Mycetococcus ehrhorni (Ckll.).

(Fig. 15 A.)

1895. *Cerococcus ehrhorni* Ckll. Psyche, vol. 7, p. 255.

1901. *Cerococcus ehrhorni* Ckll.; Patterson, Proc. Calif. Acad. Sci., ser. 3, vol. 2, p. 387, pl. 22, figs. 1-9.

A sufficiently accurate general description of the insect will be found in the papers of Cockerell and Patterson, but there are certain details that have been overlooked.

The derm in the adult female bears numerous small, 8-shaped pores and a very few, extremely minute and delicate tubular ducts that appear to be of the type common to the Asterolecanine forms.

There are no trilocular pores. The anal ring appears to be very small and is entirely obscured by the heavily chitinized anal lobes.

In the first stage larva the anal ring is extremely small and appears to bear but four very minute setæ. The terminal segment is not chitinized. There are marginal and two submedian, longitudinal rows of 8-shaped pores. The antennæ are five-segmented.

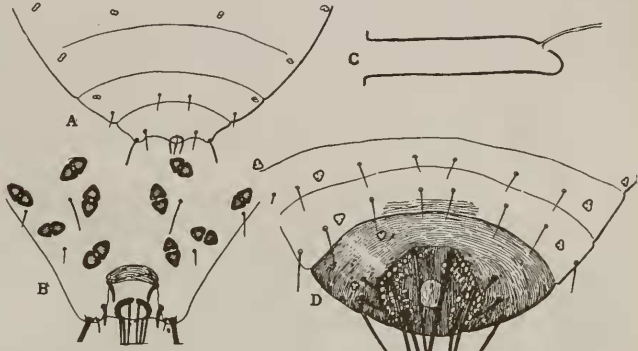


Fig. 15.—A, posterior end of abdomen of first stage larva of *Mycetococcus ehrhorni* (Ckll.); B, posterior end of the abdomen of *Cerococcus bryoides* (Maskell); C, tubular duct of *Mycetococcus corticis* (Townes. & Ckll.); D, posterior end of the first stage larva of *M. corticis*.

Mycetococcus corticis (Townes.).

(Fig. 15 C., 15 D.)

1898. *Cerococcus corticis* Townes. & Ckll., Jn. N.Y. Ent. Soc., vol. 6, p. 170.

1901. *Cerococcus corticis* Townes. & Ckll.; Patterson, Proc. Calif. Acad. Sci., ser. 3, vol. 2, p. 387, pl. 23, figs. 23-28.

As in the case of *M. ehrhorni* there are certain details that former authors have overlooked.

The derm in all stages is entirely destitute of 8-shaped pores. In the adult there are numbers of quite large, tubular ducts of a type quite unlike that usually found in the Asterolecaniinae and, in fact, unlike any that I have seen. This peculiarity arises from the fact that the delicate filamentous prolongation of the duct arises some distance before the apex of the larger portion. The anal ring is quite large and cellular.

The first stage larva bears a few trilocular pores instead of 8-shaped pores. The anal ring is very large, heavily chitinized and

cellular and bears six large setæ. The terminal segment of the body is strongly chitinized. The antennæ are 6-segmented.

Material examined.—Specimens from the type material.

Cerococcus ovoides (Ckll.)

(Fig. 16.)

1901. *Pollinia ovoides* Ckll., The Entom., vol. 34, p. 225.

1909. *Pollinia ovoides* Ckll.; Green, Coccidæ Ceylon, pt. 4, p. 340.

The description given by Cockerell needs to be amplified at several points.



Fig. 16.—*Cerococcus ovoides* (Ckll.); dorsal aspect of anal lobes of adult female, anal ring and setæ not indicated.

The adult female is in general form entirely like the other members of the genus to which I am referring the species. Legs entirely lacking. Pores of the 8-shaped type small, confined to a narrow zone extending about the body at the lateral margin. Tubular ducts abundant, small, slender, usually presenting an elbowed appearance. Two pairs of cribriform plates present, the members of each pair close together. Anal ring with 10 setæ. Anal lobes quite small, their mesal margins but slightly chitinized. Between the lobes is the characteristic "cauda" of the genus.

Cockerell states that the antennæ of the first stage larva are 6-segmented, but all the specimens examined by me show but 5 segments. The matter is not especially important as the first stage larva in other species of this genus may show either 5 or 6 segments. The 8-shaped pores of the dorsum are much smaller than those of the marginal series.

Specimens examined.—Part of the type material.

Notes.—Green has already pointed out (ref. cited) that this species appears to be close to *Cerococcus*. I am unable to find any basis for separating it generically from *C. quercus*.